CLAIMS

1. A system for producing a flow of liquid or solid xenon in an evacuated chamber, the system comprising means for pressuring and cooling a gaseous flow of xenon to a pressure and a temperature so that upon entering the evacuated chamber, the gaseous xenon liquefies or solidifies within the chamber.

2. The system as claimed in claim 1, comprising pump means for drawing the flow of gaseous xenon from the chamber to the pressurising and cooling means, and means for returning the pressurised and cooled gaseous xenon to the chamber.

3. The system as claimed in claim 2 wherein the pump means is arranged to create a pressure in the chamber in the range from 1000 mbar to 10^{-10} mbar.

4. The system as claimed in claim 2 comprising means for controlling the cooling means such that the temperature of the pressurised gaseous flow returned to the chamber is in the range from ambient temperature to -150°C.

5. The system as claimed in claim 2, wherein the pressurising means is arranged to pressurise the gaseous flow to a pressure within the range from 1 to 100 bar.

6. The system as claimed in claim 2, wherein the cooling means comprises a housing extending about a duct having an inlet for receiving the pressurised gaseous flow and an outlet for returning the flow to the chamber, the housing containing at least one coolant for cooling the flow.

7. The system as claimed in claim 2, wherein the housing contains a first coolant in thermal contact with the duct and means extending about the duct for

conveying a flow of second coolant within the housing for controlling the temperature of the first coolant.

8. The system as claimed in claim 7, wherein the housing comprises a first section and a second section, smaller than the first section, proximate the outlet, the first section containing the means for conveying the second coolant within the housing.

9. The system as claimed in claim 8, wherein the first section has a greater external diameter than the second section.

10. The system as claimed in claim 7, wherein the conveying means comprises a second duct extending about the first-mentioned duct.

11. The system as claimed in claim 10, wherein the second duct comprises a helical duct having an inlet proximate the inlet to the first duct and an outlet proximate the second section of the housing.

12. The system as claimed in claim 8, wherein the second section of the housing has a length in the direction of fluid flow through the duct in the range from 0.25m to 1.5m.

13. The system as claimed in claim 6, wherein the first coolant comprises a halocarbon.

14. The system as claimed in claim 13 wherein said halocarbon comprises tetrafluoromethane.

15. The system as claimed in claim 7, wherein the second coolant comprises a liquid coolant.

16. The system as claimed in claim 16, wherein said liquid coolant comprises liquid nitrogen.

17. The system as claimed in claim 7, comprising means for controlling the rate of flow of said second coolant within said conveying means.

18. The system as claimed in claim 6, wherein the outlet has means for attaching a nozzle thereto.

19. A system for producing a flow of liquid or solid xenon in an evacuated chamber, the system comprising pump means for drawing a flow of gaseous xenon from the chamber, means for pressurising the gaseous flow, and means for cooling the pressurised gaseous flow for return to the chamber, whereby the gaseous xenon returned to the chamber is caused to liquefy or solidify within the chamber.

20. The system as claimed in claim 19 wherein the pump means is arranged to create a pressure in the chamber in the range from 1000 mbar to 10^{-10} mbar.

21. The system as claimed in claim 19, comprising means for controlling the cooling means such that the temperature of the pressurised gaseous flow returned to the chamber is in the range from ambient temperature to -150°C.

22. The system as claimed in claim 19, wherein the pressurising means is arranged to pressurise the gaseous flow to a pressure within the range from 1 to 100 bar.

23. The system as claimed in claim 19, wherein the cooling means comprises a housing extending about a duct having an inlet for receiving the pressurised gaseous flow and an outlet for returning the flow to the chamber, the housing containing at least one coolant for cooling the flow.

24. The system as claimed in claim 19, wherein the housing contains a first coolant in thermal contact with the duct and means extending about the duct for conveying a flow of second coolant within the housing for controlling the temperature of the first coolant.

25. The system as claimed in claim 24, wherein the housing comprises a first section and a second section, smaller than the first section, proximate the outlet, the first section containing the means for conveying the second coolant within the housing.

26. The system as claimed in claim 25, wherein the first section has a greater external diameter than the second section.

27. The system as claimed in claim 26, wherein the conveying means comprises a second duct extending about the first-mentioned duct.

28. The system as claimed in claim 27, wherein the second duct comprises a helical duct having an inlet proximate the inlet to the first duct and an outlet proximate the second section of the housing.

29. The system as claimed in claim 28, wherein the second section of the housing has a length in the direction of fluid flow through the duct in the range from 0.25m to 1.5m.

30. The system as claimed in claim 25, wherein the first coolant comprises a halocarbon.

31. The system as claimed in claim 30 wherein said halocarbon comprises tetrafluoromethane.

32. The system as claimed in claim 25, wherein the second coolant comprises a liquid coolant.

33. The system as claimed in claim 32 wherein said liquid coolant comprises liquid nitrogen.

34. The system as claimed in claim 32, comprising means for controlling the rate of flow of said second coolant within said conveying means.

35. The system as claimed in claim 28, wherein the outlet has means for attaching a nozzle thereto.

36. An apparatus for cooling a flow of fluid, comprising a duct having an inlet for receiving the fluid flow and an outlet, and a housing extending about the duct, the housing containing a first coolant in thermal contact with the duct for cooling the fluid flow, the housing comprising a first section and a second section, smaller than the first section, proximate the outlet, the first section containing means in thermal contact with the first coolant for conveying within the housing a flow of a second coolant for controlling the temperature of the first coolant.

37. The apparatus as claimed in claim 36, wherein the first section has a greater external diameter than the second section.

38. The apparatus as claimed in claim 36, wherein the conveying means comprises a second duct extending about the first-mentioned duct.

39. The apparatus as claimed in claim 38, wherein the second duct comprises a helical duct having an inlet proximate the inlet to the first duct and an outlet proximate the second section of the housing.

40. The apparatus as claimed in claim 38, wherein the second section of the housing has a length in the direction of fluid flow through the duct in the range from 0.25m to 1.5m.

41. The apparatus as claimed in claim 36, wherein the first coolant comprises a halocarbon.

42. The apparatus as claimed in claim 41 wherein said halocarbon comprises tetrafluoromethane.

43. The apparatus as claimed in claim 36, wherein the second coolant comprises a liquid coolant.

44. The apparatus as claimed in claim 43 wherein said liquid coolant comprises liquid nitrogen.

45. The apparatus as claimed in claim 36, comprising means for controlling the rate of flow of said second coolant within said conveying means.

46. The apparatus as claimed in claim 36, wherein the outlet has means for attaching a nozzle thereto.

47. A method of producing a flow of liquid or solid xenon in an evacuated chamber using the system as claimed in claim 1.

48. A method of cooling a flow of fluid utilizing the apparatus as claimed in claim 36.

49. A method of producing a flow of liquid or solid xenon using the apparatus as claimed in claim 36.

50. A method of producing a flow of liquid or solid xenon in an evacuated chamber using the system as claimed in claim 19.